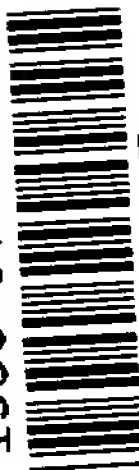


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Applicant #1, Name: Thomas Ping Hua Lee

Applicant #2, Name: _____

Title: Safety Apparatus for a Piezoelectric Lighter

☒ Specification, Claims, and Abstract: Nr. Of Sheets 11

☒ Declaration: Date Signed: MAY 12, 1997

☒ Drawing(s): Nr. Of Sheets Enc.: (In Triplicate): Formal: 4 Informal: _____

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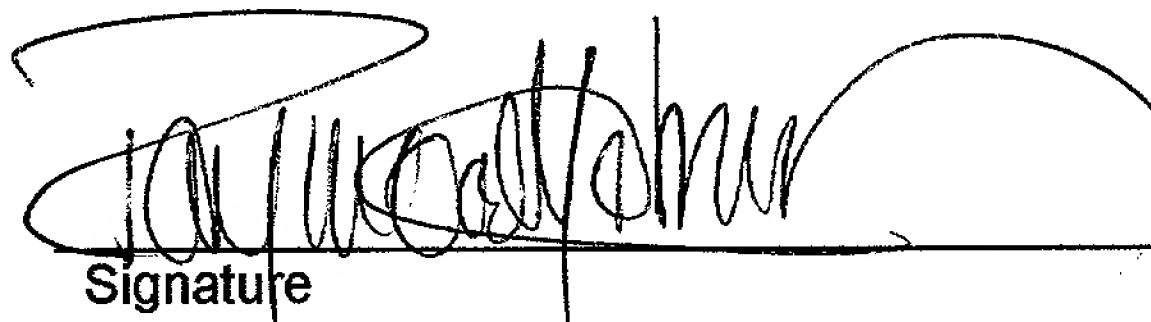
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Title

Safety Apparatus of a Piezoelectric Lighter

Field of the Present Invention

The present invention relates to a safety apparatus of a piezoelectric lighter, and more particularly to a safety apparatus for preventing under age children from the usage of cigarette lighter without adult supervision that highly decreases the rate of accident cause by fire every year.

Background of the Present Invention

It is well known that accidents cause by fire are some of the most horrible things that can happen to anyone. Over the years, there are hundreds of family who suffer from the damages caused by fire, some from the city fire and others got their home burned down around the green areas due to the forest fires. The community has always encouraged people to take any oncoming fire hazard, because we know that it's better to prevent the problem than to deal with it, and especially if we're dealing with an element of no mercy. Accidental fire had not only burned down homes and destroyed lives, but it also had killed many people over the years.

Most fires are caused accidentally by ignorance of human mistakes, especially among our young children. We tried to teach our young ones to not step into the accidental mistake of starting an accidental fire, but it is very difficult to enforce adult supervision over them twenty-four hours a day. In most accidental fire cases today, many were started by the ignorant usage of cigarette lighters, especially when someone in the family who is a smoker which having many cigarette lighters laying around the house waiting for the young one to pick it up and use it.

In the resent years, there are many safety lighters manufactured throughout the market. Many of the prior arts are based on having or hiding a safety switch on a lighter, which in most cases through a period of time, kids seem to be able to figure out how to put these safety lighters into use without any complication. As we know, the children today are very

intellectual in certain circumstances, and usually they don't seem to have a problem figuring out how to work a simple mechanical object. It is in human nature to figure out a solution to the any question, even at our young age. We can only trick their mental ability for a short period of time, but we can sure limit their physical capability.

5 Summary of the Present Invention

The main object of the present invention is to provide a safety apparatus of a piezoelectric lighter for preventing under age children from the usage of cigarette lighter without adult supervision.

Another object of the present invention is to provide a safety apparatus of a
10 piezoelectric lighter which can stop under age children from the usage of cigarette lighter by the limitation of their physical capability.

Accordingly, the present invention provides a safety apparatus of a piezoelectric lighter which comprises a casing having a liquefied gas cavity defined therein and a cap cavity;
15 a gas ejecting tip appearing from a ceiling of the casing and communicating with the liquefied gas cavity; a windshield mounted on the ceiling of the casing and encircling the gas ejection tip; a piezoelectric unit which is fitted in the casing having an igniting tip connected thereto; and a thumb-push cap, which is fitted in the cap cavity of the casing in a vertically movable manner, exposing a top portion thereof above the casing and being attached to a top end of the piezoelectric unit. The safety apparatus comprises a pressure absorbing device disposed in the
20 cap cavity of the casing of the piezoelectric lighter, a holding means integrally affixed to an interior surface of the thumb-push cap for rigidly holding one end of the pressure absorbing device in position, and a receiving means provided in the cap cavity for receiving and supporting another end of the pressure absorbing device in position. Therefore, the pressure absorbing device is vertically held between the thumb-push cap and the ceiling of the casing for
25 urging the thumb-push cap at an upper normal position thereof and providing an additional press resistance to the thumb-push cap, so as to resist a downwardly pressing force applied by an under age child on the thumb-push cap while an adult is capable of pushing down the thumb-push cap easily.

Brief Description of the Drawings

Fig. 1 is a perspective view of a safety apparatus of a piezoelectric lighter of a first preferred embodiment according to the present invention.

5 Fig. 2 is an exploded perspective view of the safety apparatus of the above first preferred embodiment according to the present invention.

Fig. 3 is a partial sectional view of the safety apparatus of the above first preferred embodiment according to the present invention.

Fig. 4 is a partial sectional view of the safety apparatus of the above first preferred embodiment according to the present invention, showing the thumb-push in igniting position.

10 Detailed Description of the Preferred Embodiment

Referring to Fig. 1, a piezoelectric lighter 5 is illustrated, which comprises a safety apparatus 30 according to a preferred embodiment of the present invention as shown in Figs. 2 to 4. The piezoelectric lighter 5, such as a standard piezoelectric lighter, comprises a casing 10 having a liquefied gas cavity 100 defined therein and a cap cavity 101; a gas ejecting tip 130 appearing from a ceiling 102 of the casing 10 and communicating with the liquefied gas cavity 100; a windshield 103 mounted on the ceiling 102 of the casing 10 and encircling the gas ejection tip 130; a piezoelectric unit 105 which is fitted in the casing 10 having an igniting tip 109 connected thereto; and a thumb-push cap 20, which is fitted in the cap cavity 101 of the casing 10 in a vertically movable manner, exposing a top portion thereof above the casing 10 and being attached to the top of the piezoelectric unit 105.

The thumb-push cap 20 is operatively connected both to the gas ejecting tip 130 and to the piezoelectric unit 105 for striking spark in response to a push to the thumb-push cap 20. A push-down action of the thumb-push cap 20 will downwardly drive and press the piezoelectric unit 105 which will generate striking spark through and out the igniting tip 109 towards the gas ejection tip 130 which is simultaneously operated to release gas by a gas rod activator 115. The ejecting gas will be ignited by the striking spark ejected from the gas ejection tip 130.

5 The safety apparatus 30 of the piezoelectric lighter 5 according to the present invention is installed inside the cap cavity 101 of the casing 10, which not only can upwardly urge the thumb-push cap 20 at an upper normal position, but also is adapted for increasing the pressure weight of the thumb-push cap 20 to a predetermined extent that the under age children are incapable of pushing it down to activate lighting with the lighter 5 for ensuring safety.

10 In order to increase the upward urging pressure of the thumb-push cap 20, the most simplest way that a person skilled in art would suggest is to fit a strong elastic spring within the cap cavity 101 to upwardly urge against the thumb-push cap 20 so that a child under five year old is unable to push down. However, the strengthened spring may also make the adults feel difficult to push down. Also, since the smoker must continuously apply a force to push down the thumb-push cap 20 for a certain period of time in order to hold the thumb-push cap 20 in its lower pushed-down position to keep the lighting flame until a cigarette is thoroughly lighted, such strong spring requires the smoker to use relatively great force to resist the upwardly urging pressure of the spring that makes the operation of the lighter become a hard task.

Moreover, the cost of a hardened strong spring is much more expensive than a normal resilient spring which is conventionally installed in the cap cavity 101 for merely propping up the thumb-push cap 20, therefore the overall manufacturing cost of the disposable piezoelectric lighter is unreasonably increased.

20 Another essential drawback of utilizing the strong spring is that the assembling process of the assembling will become more difficult. Besides, the configuration of the piezoelectric lighter must be redesigned to adapt the utilizing of strong spring because the strong upwardly urging force of the strong spring may make the thumb-push cap 20 be easily detached from the casing 10. Specific holding means must be incorporated with the casing 10 to firmly hold the thumb-push cap 20 to the casing 10.

In accordance with the present invention, the safety apparatus 30 enables the piezoelectric lighter 5 to provide a pressing resistance to the thumb-push cap 20 for preventing the children from pushing down without the need of incorporating any extra holding means and the increase of manufacturing cost.

30 The safety apparatus 30 of the present invention comprises a pressure absorbing device 31 disposed in the cap cavity 101 of the casing 10 of the piezoelectric lighter 5, a

holding means 32 integrally affixed to an interior surface of the thumb-push cap 20 for rigidly holding one end of the pressure absorbing device 31 in position, and a receiving means 33 provided in the cap cavity 101 for receiving and supporting another end of the pressure absorbing device 31 in position, so that the pressure absorbing device 31 is vertically held between the thumb-push cap 20 and the ceiling 102 of the casing for urging the thumb-push cap 20 at its upper normal position and providing an additional press resistance to the thumb-push cap 20, so as to resist the downwardly pressing force applied by an under age child while an adult can push down the thumb-push cap 20 easily.

In accordance with a preferred embodiment of the present invention, the pressure absorbing device 31 of the safety apparatus 30 comprises a deformable resistance piece 311 and an elastic element 312 coaxially attached to the deformable resistance piece 311, wherein the elastic element 312 is a soft elastic spring merely for urging and supporting the thumb-push cap 20 in its upper normal position, as shown in Fig. 3.

As shown in Fig. 2, the casing 10 upwardly protrudes two parallel U-shape mounting frames 106, 107 wherein a guiding slot 108 is defined therebetween. The windshield 103 is mounted on the ceiling 102 of the casing 10 by engaging with the two mounting frames 106, 107 in a usual manner. The thumb-push cap 20 comprises a top wall 201, a U-shape side wall 202 integrally extending downwardly from the top wall 201, a guider unit 203 horizontally extending from the top wall 201 and being received in the guiding slot 108 for guiding the up and down pushing motion of the thumb-push cap 20. The guiding slot 108 is covered by the windshield 103 so as to limited an uppermost position of the thumb-push cap 20, i.e. its upper normal position wherein a lower end portion of the side wall 202 is inserted into the cap cavity 101 in order to mount the thumb-push cap 20 on the casing 10.

According to the preferred embodiment of the present invention, the holding means 32 comprises a holding ring 321 integrally protruded from an inner surface 21 of the top wall 201 for firmly holding a top end 311a of the deformable resistance piece 311 which is made of a cylindrical rubber post. An inner diameter of the holding ring 321 is equal to or slightly smaller than an outer diameter of the top end 311a of the deformable resistance piece 311, so that the top end 311a of the deformable resistance piece 311 can be fittedly inserted into the holding ring 321. For enhancing connection of the holding ring 321 and the top end 311a of the deformable resistance piece 311, the top end 311a of the deformable resistance piece 311 can be further glued to the holding ring 321.

The receiving means 33 comprises a tubular receiving guider 331 integrally and upwardly extended from a raised platform of the ceiling 102 of the casing 10 within the cap cavity 101, wherein the receiving guider 331 has an inner diameter slightly larger than the outer diameter of a bottom end of the deformable resistance piece 311 and a length longer than the length of the elastic element 312. The elastic element 312 is received inside the receiving guider 331. In order to achieve a guiding effect for the deformable resistance piece 311, the deformable resistance piece 311 is designed to have a length larger than a distance between the holding ring 321 and the receiving guider 331. The lower end of the deformable resistance piece 311 is inserted into the receiving guider 331 and pressed on the elastic element 312 so as to vertically hold the deformable resistance piece 311 in position. In other words, the elastic element 312 provides an elastic force urging upwardly against the deformable resistance piece 311 and the thumb-push cap 20, so as to retain the thumb-push cap 20 in its upper normal position, as shown in Fig. 3

Referring to Fig. 4, when the thumb-push cap 20 is pushed downwardly to a lower igniting position by the user's thumb in order to actuate the piezoelectric unit 105 and the gas ejecting tip 130 to provide lighting flame, the elastic element 312 will first be compressed within the receiving guider 331 by the downwardly moving deformable resistance piece 311 to lower to its maximum contraction which will cause a stopping force for the deformable resistance piece 311, and then the deformable resistance piece 311 is compressed to deform by increasing its diameter due to the downward pressure applied by the user's thumb. Practically, the deformable resistance piece 311 is compressible through deformation when a predetermined amount of pressure is pressed thereon, so that the deformable resistance piece 311, in fact, provides a resistance effect to the under age children who do not have enough physical strength to compress the deformable resistance piece 311. However, an adult may easily push down the thumb-push cap 20 to deform the deformable resistance piece 311 and compress the elastic element 312 for igniting purpose.

By releasing the thumb-push cap 20, the compressed elastic element 312 will then rebound to regain its original form to upwardly push the thumb-push cap 20 returning from the lower igniting position (as shown in Fig. 4) to its upper normal position (as shown in Fig. 3) instantly. At that moment, the deformed deformable resistance piece 311 will also restore to its original cylindrical shape. It is worth to mention that the receiving guider 312 further provides an essential function of guiding the up and down motion of the deformable resistance piece 311.

I Claim:

1. A safety apparatus of a piezoelectric lighter which comprises a casing having a liquefied gas cavity defined therein and a cap cavity; a gas ejecting tip appearing from a ceiling of said casing and communicating with said liquefied gas cavity; a windshield mounted on said ceiling of said casing and encircling said gas ejection tip; a piezoelectric unit which is fitted in said casing having an igniting tip connected thereto; and a thumb-push cap, which is fitted in said cap cavity of said casing in a vertically movable manner, exposing a top portion thereof above said casing and being attached to a top end of said piezoelectric unit; wherein said safety apparatus comprises a pressure absorbing device disposed in said cap cavity of said casing of said piezoelectric lighter, a holding means integrally affixed to an interior surface of said thumb-push cap for rigidly holding one end of said pressure absorbing device in position, and a receiving means provided in said cap cavity for receiving and supporting another end of said pressure absorbing device in position, so that said pressure absorbing device is vertically held between said thumb-push cap and said ceiling of said casing for urging said thumb-push cap at an upper normal position thereof and providing an additional press resistance to said thumb-push cap, so as to resist a downwardly pressing force applied by an under age child on said thumb-push cap while an adult is capable of pushing down said thumb-push cap easily.

2. A safety apparatus of a piezoelectric lighter, as recited in claim 1, wherein said pressure absorbing device comprises a deformable resistance piece and an elastic element coaxially attached to said deformable resistance piece, said elastic element being a soft elastic spring merely for urging and supporting said thumb-push cap in the upper normal position thereof.

3. A safety apparatus of a piezoelectric lighter, as recited in claim 2, wherein said holding means comprises a holding ring integrally protruded from an inner surface of a top wall of said thumb-push cap for firmly holding a top end of said deformable resistance piece, said top end of said deformable resistance piece being fittedly inserted into said holding ring.

4. A safety apparatus of a piezoelectric lighter, as recited in claim 2, wherein said receiving means comprises a tubular receiving guider integrally and upwardly extended from said ceiling of said casing within said cap cavity, wherein said receiving guider has an inner diameter slightly larger than an outer diameter of a bottom end of said deformable resistance piece and a length longer than a length of said elastic element, said elastic element being

received inside said receiving guider, and that said deformable resistance piece has a length larger than a distance between said holding means and said receiving guider, said lower end of said deformable resistance piece being inserted into said receiving guider and pressed on said elastic element so as to vertically hold said deformable resistance piece in position, so that said elastic element provides an elastic force urging upwardly against said deformable resistance piece and said thumb-push cap so as to retain said thumb-push cap in the upper normal position thereof.

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5. A safety apparatus of a piezoelectric lighter, as recited in claim 3, wherein said receiving means comprises a tubular receiving guider integrally and upwardly extended from said ceiling of said casing within said cap cavity, wherein said receiving guider has an inner diameter slightly larger than an outer diameter of a bottom end of said deformable resistance piece and a length longer than a length of said elastic element, said elastic element being received inside said receiving guider, and that said deformable resistance piece has a length larger than a distance between said holding ring and said receiving guider, said lower end of said deformable resistance piece being inserted into said receiving guider and pressed on said elastic element so as to vertically hold said deformable resistance piece in position, so that said elastic element provides an elastic force urging upwardly against said deformable resistance piece and said thumb-push cap so as to retain said thumb-push cap in the upper normal position thereof

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6. A safety lighter of a piezoelectric lighter, as recited in claim 3, wherein said top end of said deformable resistance piece is glued to said holding ring.

7. A safety lighter of a piezoelectric lighter, as recited in claim 5, wherein said top end of said deformable resistance piece is glued to said holding ring.

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8. A safety lighter of a piezoelectric lighter, as recited in claim 2, wherein said deformable resistance piece is made of a cylindrical rubber post.

9. A safety lighter of a piezoelectric lighter, as recited in claim 3, wherein said deformable resistance piece is made of a cylindrical rubber post.

10. A safety lighter of a piezoelectric lighter, as recited in claim 4, wherein said deformable resistance piece is made of a cylindrical rubber post.

Safety Lighter of a Piezoelectric Lighter

Abstract of the Disclosure

A safety apparatus of a piezoelectric lighter includes a pressure absorbing device disposed in a cap cavity of a casing of the piezoelectric lighter, a holding means integrally affixed to an interior surface of a thumb-push cap for rigidly holding one end of the pressure absorbing device in position, and a receiving means provided in the cap cavity for receiving and supporting another end of the pressure absorbing device in position. Therefore the pressure absorbing device is vertically held between the thumb-push cap and the ceiling of the casing for urging the thumb-push cap at an upper normal position thereof and providing an additional press resistance to the thumb-push cap, so as to resist a downwardly pressing force applied by an under age child on the thumb-push cap while an adult is capable of pushing down the thumb-push cap easily

Applicant or Patentee: _____ Attorney's
Serial or Patent No.: _____ Docket No.: USP7252A-TL
Filed or Issued: _____
For: _____

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9 (f) and 1.27 (b)) – INDEPENDENT INVENTOR**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9 (c) for purposes of paying reduced fees under section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:
Safety Apparatus for a Piezoelectric Lighter described in:

- ☒ the specification filed herewith
☐ application serial no. _____, filed _____
☐ patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9 (c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9 (d) or a non profit organization under 37 CFR 1.9 (e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ no such person, concern, or organization
☐ person, concern or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)


FULL NAME _____
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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28 (b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statements is directed.

Thomas Ping Hua Lee
NAME OF INVENTOR NAME OF INVENTOR NAME OF INVENTOR

Signature of Inventor Signature of Inventor Signature of Inventor
May 12, 1997
Date Date Date

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Safety Apparatus for a Piezoelectric Lighter

the specification of which is attached hereto unless the following box is checked:

☐ was filed on _____ as United States Application Number or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Claimed

☐ Yes ☐ No

(Number) (Country) (Day/Month/Year Filed)

☐ Yes ☐ No

(Number) (Country) (Day/Month/Year Filed)

☐ Yes ☐ No

(Number) (Country) (Day/Month/Year Filed)

I hereby claimed the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Number) (Filing Date) (Status-patented, pending, abandoned)

(Application Number) (Filing Date) (Status-patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s), with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Raymond Yat Chiu Chan, Reg. No. 37,484

Address all correspondence to: **516 San Luis Rey Road, Arcadia, CA 91007**

Telephone Calls to: **(818) 571-9812**

I hereby declare that all Statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willfull false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor (given name, family name) Thomas Ping Hua Lee

Inventor's signature Thomas Lee Date May 12, 1997
Residence 128 Brent Circle, Industry, CA 91789 Citizenship Taiwan, R.O.C.
Post Office Address Same as above

Full name of second joint inventor, if any (given name, family name) _____

Second Inventor's signature _____ Date _____
Residence _____ Citizenship _____
Post Office Address _____

☐ Additional inventors are being named on separately numbered sheets attached hereto.

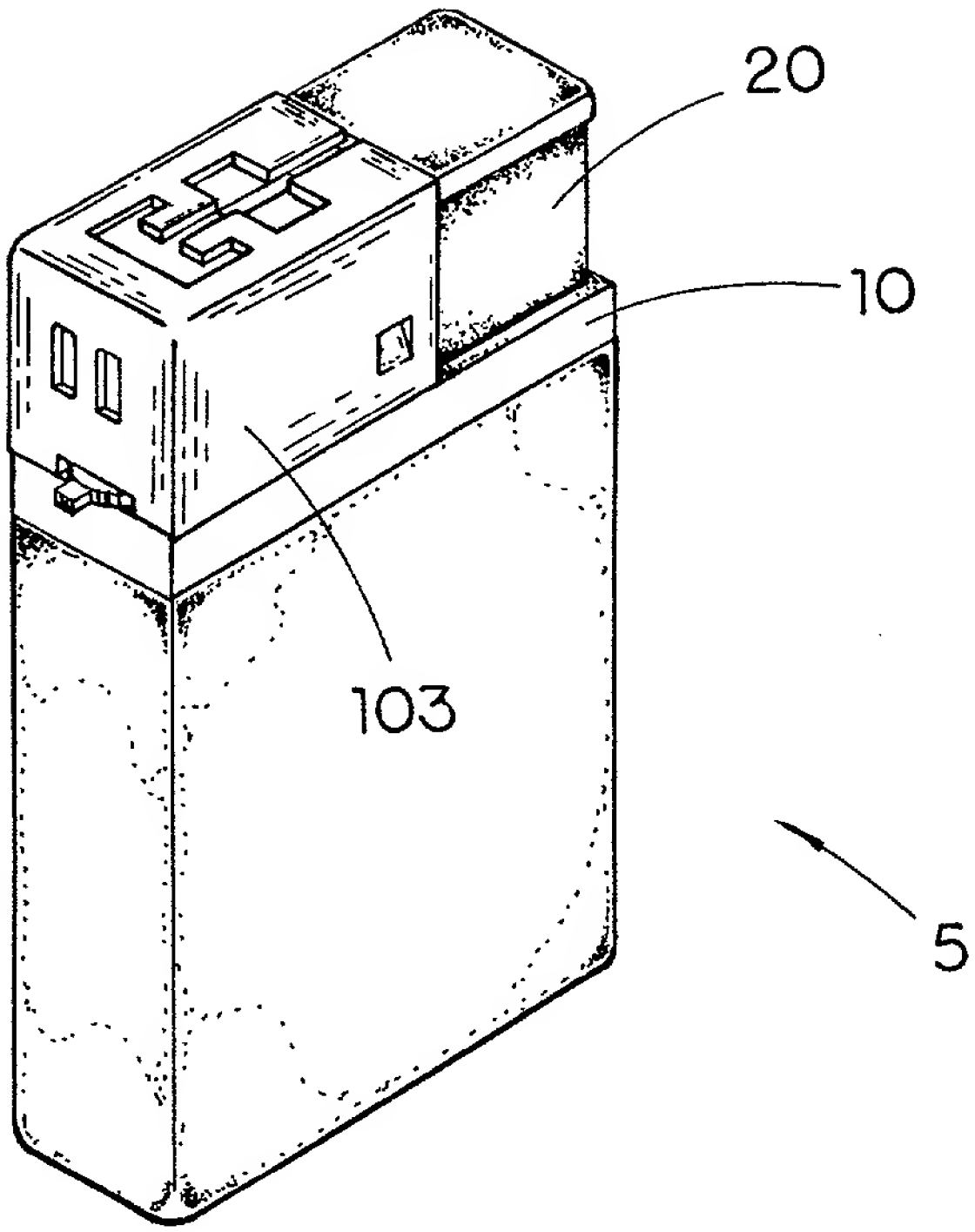


FIG. 1

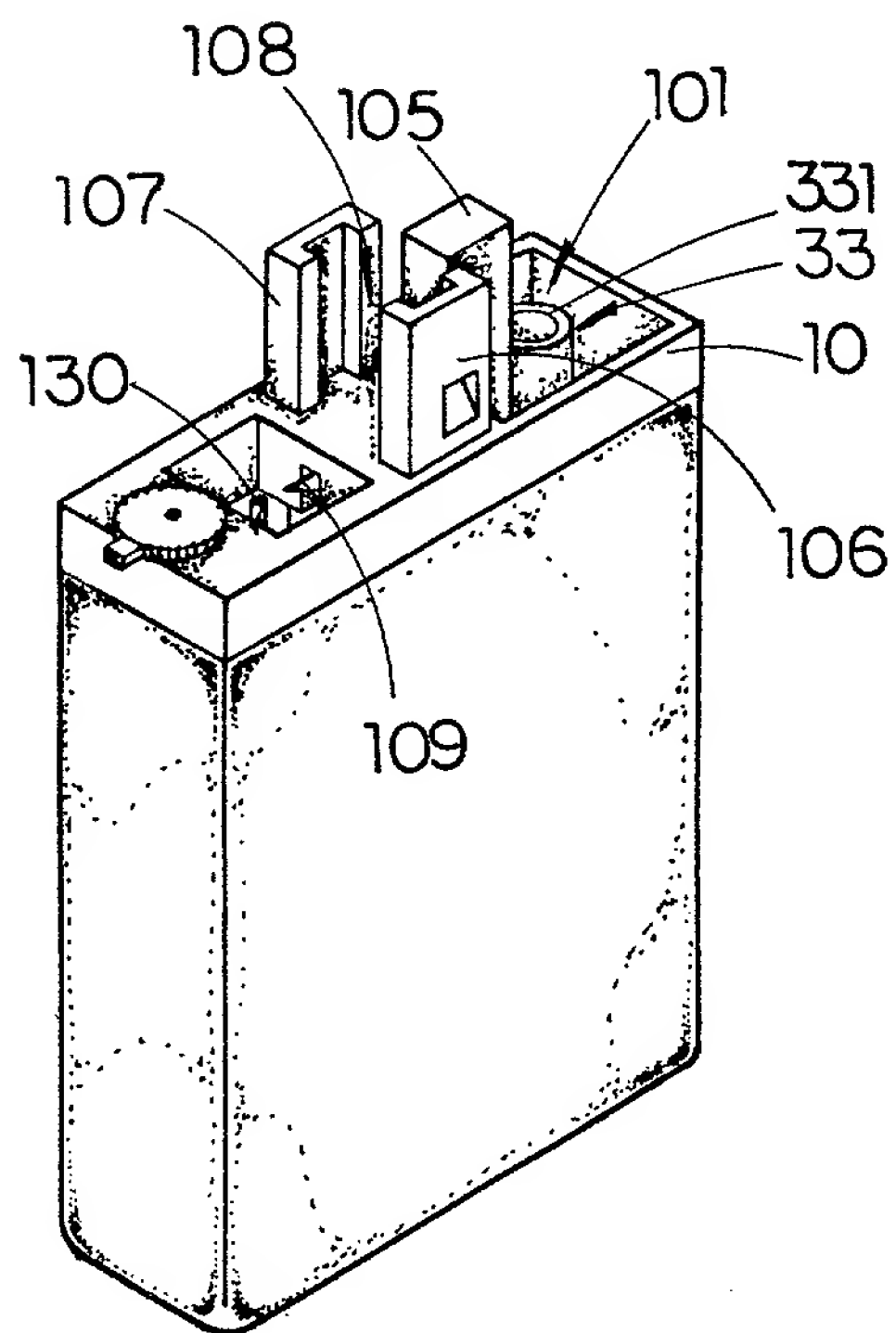
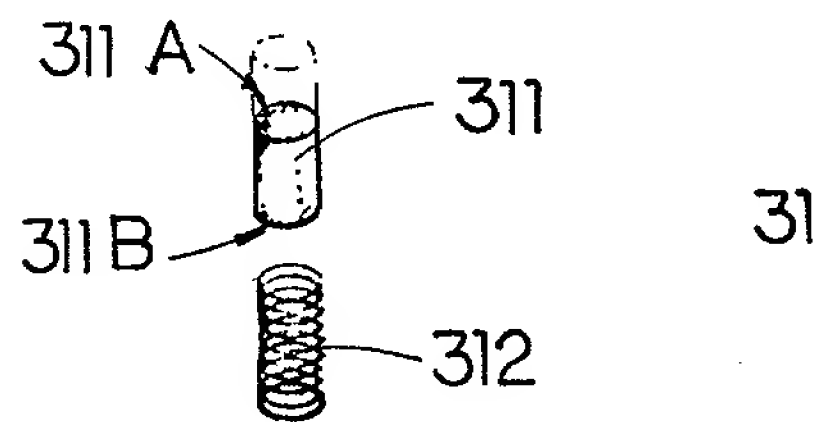
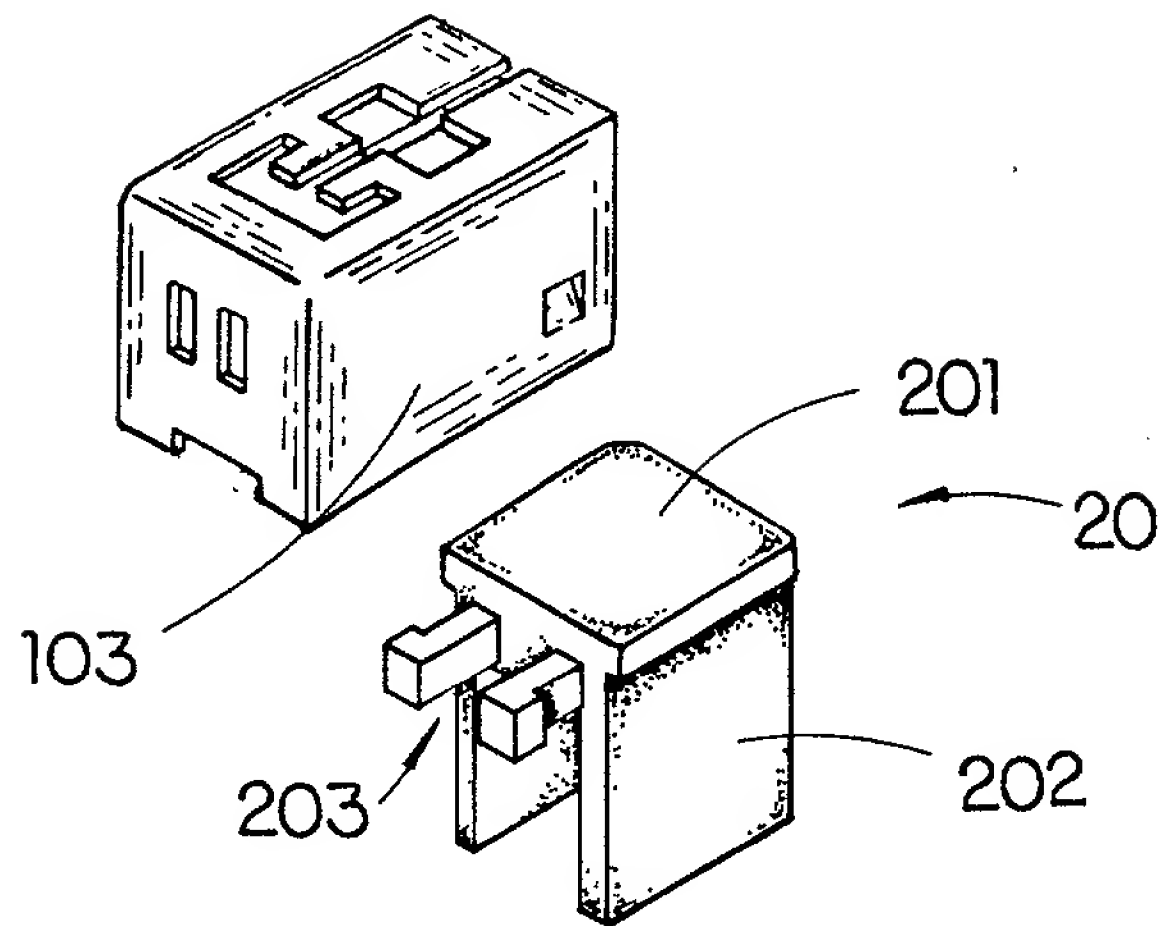


FIG. 2

FIG. 3

FIG.4